

# Cody Rivera

## Curriculum Vitae

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🐙 [codyjr3](https://github.com/codyjr3)

## Education

- 2022–present **Ph.D. in Computer Science**, *University of Illinois Urbana-Champaign*, Urbana, IL  
Advisor: Madhusudan Parthasarathy.  
GPA: 4.0/4.0.  
Expected Completion Date: May 2027.
- 2018–2022 **B.S. in Computer Science and Mathematics**, *University of Alabama*, Tuscaloosa, AL  
GPA: 4.0/4.0. *Summa Cum Laude*.  
Minor: Randall Research Scholars Program.

## Research Experience

- 2022–present **Graduate Research Assistant**, *University of Illinois Urbana-Champaign*, Urbana, IL  
Developing a discipline of predictable verification for data structure manipulating programs. Applying this discipline to verifying systems software. Supervised by Madhusudan Parthasarathy.
- 2022–present **Graduate Research Assistant**, *University of Illinois Urbana-Champaign*, Urbana, IL  
Using approximate solvers for non-linear real arithmetic to speed up differential privacy verification and expand the class of programs that can be verified. Supervised by Mahesh Viswanathan.
- 2019–2022 **Undergraduate Research Assistant, High-Performance Computing and Data Analytics Lab**, *University of Alabama/Washington State University*, Tuscaloosa, AL  
Researched parallel GPU algorithms to process vast amounts of data in scientific computation workloads such as large scale simulations more efficiently. Supervised by Dingwen Tao.
- Summer 2021 **Science Undergraduate Laboratory Internship (SULI) Program Intern**, *Argonne National Laboratory*, Virtual Internship  
Improved the performance of lossy decompression for multidimensional scientific datasets by optimizing parallel Huffman decoding for GPUs. Supervised by Sheng Di.

## Publications

### Drafts and Preprints

- C. Rivera**, B. Bhusal, R. Chadha, A.P. Sistla, and M. Viswanathan, “Checking  $\delta$ -Satisfiability of Reals with Integrals,” *Under Submission*, 2024.
- A. Murali, **C. Rivera**, and P. Madhusudan, “Predictable Verification using Intrinsic Definitions,” *Under Submission*, 2023.

### Conference Publications

- IPDPS 2022 **C. Rivera**, S. Di, J. Tian, X. Yu, D. Tao, and F. Cappello, “Optimizing Huffman Decoding for Error-Bounded Lossy Compression on GPUs,” *The 36th IEEE International Parallel and Distributed Processing Symposium*, Virtual Event, May 30–June 3, 2022, pp. 717–27. [Acceptance Rate: 25% (123/474)]

- Cluster 2021 J. Tian, S. Di, X. Yu, **C. Rivera**, K. Zhao, S. Jin, Y. Feng, X. Liang, D. Tao, and F. Cappelto, "Optimizing Error-Bounded Lossy Compression for Scientific Data on GPUs," *2021 IEEE International Conference on Cluster Computing*, Virtual Event, September 7-10, 2021, pp. 283-93. [Acceptance Rate: 29% (48/163)]
- IPDPS 2021 J. Tian, **C. Rivera**, S. Di, J. Chen, X. Liang, D. Tao, and F. Cappelto, "Revisiting Huffman Coding: Toward Extreme Performance on Modern GPU Architectures," *The 35th IEEE International Parallel and Distributed Processing Symposium*, Virtual Event, May 17-21, 2021, pp. 881-91. [Acceptance Rate: 22% (105/462)]
- PACT 2020 J. Tian, S. Di, K. Zhao, **C. Rivera**, M. H. Fulp, R. Underwood, S. Jin, X. Liang, J. Calhoun, D. Tao, and F. Cappelto, "cuSZ: An Efficient GPU-Based Error-Bounded Lossy Compression Framework for Scientific Data," *The 29th International Conference on Parallel Architectures and Compilation Techniques*, Atlanta, GA, Oct 3-7, 2020, pp. 3-15. [Acceptance Rate: 25% (35/137)]

### Journal Publications

- JPDC **C. Rivera\***, J. Chen\*, N. Xiong, S. Song, and D. Tao, "TSM2X: High-Performance Tall-and-Skinny Matrix-Matrix Multiplication on GPUs," *Journal of Parallel and Distributed Computing*, Volume 151, 2021, pp. 70-85. [Impact Factor: 3.734]

### Awards

- October 2023 **Travel Grant**, *Midwest Programming Languages Summit, University of Michigan*
- 2023–2024 **Computer Science Ph.D. Fellowship**, *Department of Computer Science, University of Illinois Urbana-Champaign*
- January 2023 **PLMW Travel Grant**, *POPL 2023, ACM SIGPLAN*
- 2022–2026 **Graduate College Fellowship**, *University of Illinois Urbana-Champaign*
- 2022–2026 **SURGE Fellowship**, *Grainger College of Engineering, University of Illinois Urbana-Champaign*
- 2022–2023 **Wing Kai Cheng Fellowship**, *Department of Computer Science, University of Illinois Urbana-Champaign*
- Summer 2022 **Housing Grant**, *Oregon Programming Languages Summer School, University of Oregon*
- Spring 2022 **Outstanding Undergraduate Award**, *Department of Computer Science, University of Alabama*
- Spring 2022 **H. H. Chapman Outstanding Computer User Award**, *Randall Research Scholars Program, University of Alabama*
- Fall 2021 **R&D 100 Award Winner**, *For "SZ: A Lossy Compression Framework for Scientific Data"*
- Summer 2020 **Outstanding Sophomore Award**, *Randall Research Scholars Program, University of Alabama*
- Spring 2020 **Outstanding Undergraduate Researcher Award**, *Department of Computer Science, University of Alabama*
- 2018–2022 **Fellowship Award**, *Randall Research Scholars Program, University of Alabama*
- 2018–2022 **Engineering Leadership Scholarship**, *College of Engineering, University of Alabama*
- 2018–2022 **Presidential Scholarship**, *University of Alabama*

### Software Artifacts

- cuSZ A GPU version of SZ, an error-bounded lossy compressor for scientific data, implemented in CUDA C++ for Nvidia GPUs. Compresses data with compression ratios up to 3.48x higher than other state-of-the-art GPU lossy compressors. [URL: <https://szcompressor.org/>]

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\*Equal contribution

TSM2X A collection of two GPU algorithms for multiplying irregular-shaped tall-and-skinny matrices: TSM2L and TSM2R. Implemented in CUDA C++ and tuned to obtain average speedups of 1.9x over the vendor-supplied CUBLAS library. [URL: <https://github.com/codyjrivera/tsm2x-imp>]

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## Teaching Experience

Fall 2020 **Undergraduate Teaching Assistant (CS 100: Computer Science I for Majors)**, *University of Alabama*, Tuscaloosa, AL  
Spring 2020  
Fall 2019 Tutored students during laboratory sessions and graded student projects.

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## Other Experience

Summer 2020 **Student Training in Engineering Program (STEP) Intern**, *Google*, Virtual Internship  
Developed GrowPod, a web app that allows users to join, create, and administer community gardens using Google Cloud App Engine and Angular.

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## Workshops and Summer Schools

October 2023 **Midwest Programming Languages Summit**, *University of Michigan*, Ann Arbor, MI  
Poster: "Predictive Verification using Intrinsic Definitions of Data Structures," with Adithya Murali and P. Madhusudan.  
January 2023 **Programming Languages Mentoring Workshop**, *POPL 2023*, Boston, MA  
Summer 2022 **Oregon Programming Languages Summer School**, *University of Oregon*, Eugene, OR

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## Coursework and Technical Skills

### Relevant Coursework:

- **University of Illinois:** Proof Automation, Compiler Construction, Logic in Computer Science, Formal Software Development Methods, Trustworthy AI Systems (Current), Programming Language Design (Current)
- **University of Alabama:** Programming Languages, Compiler Construction, Real Analysis I and II, Abstract Algebra I and II, General Topology, Algebraic Topology

**Programming Languages:** C, C++, Python, Java, OCaml, Scala, Dafny, JavaScript, TypeScript

**Platforms and Tools:** Z3, CUDA, OpenMP, Google Cloud, HTML, CSS, LaTeX